

MILITARY SPECIFICATION.

MOLDING PLASTIC, POLYAMIDE (NYLON), RIGID

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers rigid polyamide (nylon) molding plastic to be used for general-purpose, weather-resistant, and dielectric applications. (See 6.1 to 6.1.3, inclusive.)

1.2 Classification. The nylon plastic covered by this specification shall be of the following compositions and types, and as specified (see 6.2):

Composition A - Polyhexamethyleneamide (see 6.1):

- Type I - General purpose
- Type IA - General purpose, heat stable.
- Type II - Weather resistant
- Type III - Low water absorption

Composition B - Polycaprolactam (see 6.1):

- Types IV and IVA - General purpose
- Type V - Weather resistant

Composition C - Polyundecanoamide (see 6.1):

- Type VI - Low water absorption, general purpose
- Type VIA - Low water absorption, heat stable.
- Type VIB - Weather resistant, Black

1.2.1 Grades. Type III, VI, VIA, & VIB nylon plastic shall also be classified as grade E when control of its electrical properties are required (see 3.2.2 and 6.2).

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

- VV-I-530 - Insulating Oil, Electrical (for Transformers, Switches, and Circuit Breakers).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: (US Army Electronics Command, ATTN: DRSEL-RD-TS-S Fort Monmouth, N.J. 07703) by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

FEDERAL

FEDERAL STANDARD NO. 356 - Commercial Packaging of Supplies and Equipment.
FEDERAL TEST METHOD STD NO. 406 - Plastics: Method of Testing.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D638 - Tensile Properties of Plastics.
- D747 - Stiffness of Plastics by means of a Cantilever Beam
- D789 - Nylon Injection Molding and Extruding Compositions.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia PA 19103).

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

3. REQUIREMENTS

3.1 Material. The material shall consist of virgin unplasticized nylon plastic formulated to meet the requirements of this specification, and shall be suitable for compression or injection molding, or for extrusion, as specified (see 6.2).

3.1.1 Color. The nylon plastic shall be furnished in the color specified and within the tolerance specified (see 6.2). Types II and V shall be of the carbon content specified in table I (see 4.5.3.4).

3.2 Property values. The values obtained from each set of samples or specimens for any property, after each conditioning procedure specified in table I or II, as applicable, shall be averaged, and the results obtained shall meet the required values specified in table I or II, as applicable. However, if any one value for a specimen deviates more than 20 percent from the average obtained on test, and if the value for such specimen is below the minimum or above the maximum value specified, as applicable, the material shall be considered to have failed the test involved.

3.2.1 All types. Samples and specimens shall meet the requirements of table I, as applicable.

3.2.2 Grade E. When grade E is specified for type III, type VI, type VIA, and type VIB nylon plastic (see 6.2), samples and specimens shall meet the requirements of table I, as applicable, and table II.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

TABLE I. Property values for nylon plastic.

Property to be tested (see Table VI)	Conditioning procedure (see 4.5.2.4.3)	Value required									
		Composition A					Composition B				
		Type I	Type IA	Type II	Type III	Type IV	Type IVA	Type V	Composition C Type VI	Type VIA	Type VIB
Melting point, range, incl. °C	---	250 to 260	250 to 260	250 to 260	208 to 220	215 to 225	215 to 225	220 to 233	185 to 195	185 to 195	185 to 195
Specific gravity 1/ 23°C, range,	---	1.13 to 1.15	1.13 to 1.15	1.13 to 1.18	1.05 to 1.09	1.12 to 1.14	1.13 to 1.15	1.13 to 1.18	1.02 to 1.06	1.02 to 1.06	1.02 to 1.06
Inclusive	---	1.4	1.4	1.6	4.0	3.0	3.0	3.0	10.0	10.0	10.0
Deformation under load, 2,000 psi, maximum, percent	(See method 1101, FED-STD-406)	---	---	---	---	---	---	---	---	---	---
Stiffness, minimum, psi	C-96/23/50	200,000	200,000	275,000	140,000	180,000	180,000	200,000	130,000	120,000	135,000
Relative viscosity 4/ range, inclusive, minimum	---	49	49	45	---	60	45	45	1.60	1.60	---
Tensile strength at 23°C minimum psi	C-48/23/50	11,000	7,000	---	7,000	10,000	9,000	---	7,000	7,000	7,000
Elongation, minimum, percent 5/	C-48/23/50	50	45	---	50	200	50	---	250	150	250
Impact strength at 23°C, minimum, foot- pounds per inch of notch 5/	C-96/23/50	0.80	0.80	---	0.90	1.2	1.0	---	1.30	1.30	1.10
Heat-distortion temperature, minimum °C: At 66 psi fiber stress	C-96/23/50	182	182	---	149	160	170	---	150	150	150
At 264 psi fiber stress		66	66	---	52	60	65	---	50	50	50
Water-absorption, maxi- mum, percent	E-48/50-des +0-24/23	1.5	1.5	---	0.7	2.5	2.0	---	0.3	0.3	0.3
Absorbance, minimum, percent	---	---	---	0.23	---	---	---	0.18	---	---	0.085
Carbon content, range, inclusive, percent	---	---	---	1.90 to 2.25	---	---	---	1.90 to 2.25	---	---	0.29 to 0.31
Moisture content, Maximum, percent	---	0.28	0.28	0.31	0.28	0.28	0.28	0.25	0.25	0.25	0.25
Granulation 2/, maxi- mum, number of lumps over 1/2 inch	---	---	---	6 (3/)	---	---	---	6 (3/)	---	---	---
Contamination	---	---	---	---	---	---	---	---	---	---	---

1/ Except for types II and V, applicable to unpigmented material only.
 2/ Determinations shall be made on an 8-ounce sample.
 3/ There shall be no contamination or nonblack granules.

4/ Determination shall be made on samples of molding or extrusion materials for types I, IA, II, III, IV, IVA, and V only.
 For types VI and VIA determinations shall be made on molding-powder samples.

5/ These values are based on natural color. Pigments added may lower values.
 For type VIA, testing of the minimum elongation shall have a conditioning procedure of E-24/140 (in a circulating air oven) +C-24/23/50.

4.1.1 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The contractor shall establish calibration of inspection equipment to the satisfaction of the Government.

4.1.2 Additional inspection. Nothing specified herein shall preclude the contractor from taking such additional samples and making such additional inspection as he may deem necessary or desirable to assure conformance of the nylon plastic to this specification.

4.1.3 Government. Acceptance of the nylon plastic shall be based upon verification by the Government of the supplier's compliance with the requirements of this specification. The Government may, at its option, repeat any or all of the inspection specified herein (see 6.3).

4.2 Classification of inspection. The inspection specified herein is classified as follows:

- a. Quality conformance inspection (see 4.4).

TABLE II. Additional property values for grade E nylon plastic.

Property to be tested (see table VI)	Conditioning procedure (see 4.5.2.4.3)	Value required
Insulation resistance, minimum megohms - - - - -	C-96/23/50	5x10 ⁶
Dielectric strength, step-by- step test (flatwise), minimum volts per mil - - - - -	C-96/23/50	375
Dielectric constant, at 1 megacycle, maximum - - - - -	C-96/23/50 +D-48/50+D-1/2/23	4.0
Dissipation factor, at 1 megacycle, maximum - - - - -	C-96/23/50 +D-48/50+D-1/2/23	0.11

4.3 Inspection conditions. Unless otherwise specified herein, all inspection shall be made under the inspection conditions specified in the general requirements of FED. TEST METHOD STD. No. 406.

4.4 Quality conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of batch-acceptance inspection (see 4.4.1.2) and periodic batch-check inspection (see 4.4.1.3).

4.4.1.1 Batch. A batch of nylon plastic is defined as a unit of product prepared for shipment, and may consist of a blend of two or more "production runs" of material.

4.4.1.2 Batch-acceptance inspection. Batch-acceptance inspection shall be made on each batch and shall be the basis on which acceptance or rejection of the batch is made. The batch-acceptance inspection shall consist of the tests specified in table III, as applicable.

TABLE III. Batch-acceptance inspection.

Test	Applicability	Requirement table	Method table
Melting point - - -	All types	Table I	Table VI
Specific gravity---	All types		
Relative viscosity-	All types		
Absorbance- - - -	Types II,V,VIB		
Moisture content- -	All types		
Carbon content- - -	Types II,V,VIB		

4.4.1.3 Periodic batch-check inspection. Periodic batch-check inspection shall be made on the first batch of compound furnished under this specification and on every twelfth batch thereafter or once each year, whichever is more frequent. The periodic batch-check inspection shall consist of the tests specified in table IV, as applicable. Shipment of batches shall not be held up pending completion of the periodic batch-check inspection.

TABLE IV. Periodic batch-check inspection.

Test	Applicability	Requirement table	Method table
Deformation under load - - - -	All types	Table I	Table VI
Stiffness- - - - -	All types		
Tensile strength - - - - -	Types I, IA, III, IV, IVA, VI, VIA, and VIB		
Elongation - - - - -	Types I, IA, III, IV IVA, VI, VIA and VIB		
Impact strength- - - - -	Types I, IA, III, IV IVA, VI, VIA, and VIB		
Heat distortion-temperature- -	Types I, IA, III, IV and IVA		
Water absorption - - - - -	All types		
Granulation- - - - -	Types II and V		
Contamination- - - - -	Types II and V		
Insulation resistance- - - -	Types III, VI, VIA,VIB and Grade E		
Dielectric strength, step-by-step test (flatwise)- - - -	Types III, VI, VIA,VIB and Grade E	Table II	
Dielectric constant- - - - -	Types III, VI, VIA,VIB and Grade E		
Dissipation factor - - - - -	Types III, VI, VIA,VIB and Grade E		

4.4.1.4 Failure. Failure to comply with any of the requirements of this specification, as applicable, shall result in rejection of the batch.

4.4.1.5 Action in case of batch rejection. If a batch is rejected as the result of failing batch-acceptance or periodic batch-check inspection, no further batches shall be accepted for inspection until the contractor has taken corrective measures and has satisfied the Government that these measures shall enable the material to meet the requirements of this specification. Rejected batches may be reworked and resubmitted, but shall be kept separate from new batches.

4.4.2 Inspection of packaging. Five containers or 100 percent of the procurement, whichever is less, shall be inspected to determine compliance with the packaging requirements. Inspection of the packaging requirements in Federal Standard 356 shall be as specified in the contract (see 6.2). Any deviation from the requirements specified shall constitute cause to reject the material offered for acceptance.

4.5 Methods of test.

4.5.1 Sampling. Five containers (packages or drums) shall be taken at random from each batch offered for acceptance inspection. A sample of sufficient quantity shall be taken from the approximate center of each container to furnish sufficient compound for the contractor to mold specimens for the required tests.

4.5.2 Samples and specimens.

4.5.2.1 Number and form. The number of samples and specimens, as applicable, and the form of specimens to be tested shall be as specified in table VI.

4.5.2.2 Preparation. When required, specimens shall be molded, using the contractor's recommended technique. Samples and specimens shall then be sealed in airtight, preheated jars, or other moistureproof containers brought to room temperature, and kept sealed until they are conditioned (tables I and II) or tested.

4.5.2.3 Tolerances. Unless otherwise specified herein, tolerances on dimensions shall be ± 5 percent.

4.5.2.4 Conditioning. Specimens shall be conditioned before test as specified in tables I and II, as applicable.

4.5.2.4.1 Designation. The type of conditioning required shall be designated as follows:

- Condition C - Humidity conditioning.
- Condition D - Immersion conditioning in distilled water.
- Condition E - Temperature conditioning.
- Condition des - Desiccation conditioning, cooling over silica gel, calcium chloride, or calcium sulfate in a desiccator at $23^{\circ} \pm 5^{\circ}\text{C}$ for 16 to 20 hours, inclusive.

4.5.2.4.2 Procedures. The conditioning procedure required, with the exception of condition des, shall be specified by the following combination of symbols:

- a. A capital letter indicating the type of conditioning.
- b. A number indicating in hours the duration of the conditioning.
- c. A number indicating in degrees celsius the conditioning temperature.
- d. A number indicating relative humidity, wherever relative humidity is controlled.

The numbers shall be separated from each other by slant marks, and from the capital letter by a dash. A sequence of conditions shall be denoted by the use of a plus (+) sign between successive conditions.

4.5.2.4.3 Time tolerances and testing information. Time tolerances and additional testing information shall be as specified in table V.

4.5.2.5 Measurement of specimens. Specimens shall be examined, and dimensions required to be recorded shall be measured to the nearest 0.001 inch by using a suitable micrometer or vernier caliper. All other dimensions shall be measured to the nearest 1/32 inch. Dimensions shall be measured before testing in each case and after completion of the test, whenever required.

TABLE V. Time tolerances and testing information.

Test	Time tolerance (hours)			Test temperature humidity, and tolerances	Remarks
	Oven, air, or desiccator	Hot water	Cool water		
C-96/23/50 --	-0, +2	---	---	23 \pm 5°C, percent 50 \pm 5 percent RH	Start test within 2 minutes after removing specimens from final conditioning bath. <u>1/</u>
C-48/23/50 --	-0, +2	---	---		
C-96/23/50 --	-0, +2	-0, +2	-0, +2		
+D-48/50 --	---	---	---		
+D-1/2/23 --	---	---	---		
E-48/50+des --	-0, +2	---	-0, +2		
+D-24/23 --	---	---	---		
E-24/140 --	-0, +2	---	---		
+C-24/23/50 --	---	---	---		

1/ After immersion conditioning, surface water shall be removed by wiping the specimen with a damp cloth, followed by wiping with a dry cloth.

4.5.3 Apparatus and procedure. The apparatus and procedure shall be as specified in the methods listed in table VI and as modified herein.

4.5.3.1 Tensile strength and elongation. The rate of head travel shall be 2 inches per minute.

4.5.3.2 Water absorption. Oven conditioning at 50° \pm 2°C shall be for 48 hours.

4.5.3.3 Absorbance. A dispersion of carbon black in phenol shall be obtained by dissolving carbon-filled nylon in 85 \pm 3 percent phenol, reagent grade. The amount of light scattered by the carbon-black dispersion shall be measured in a 1 centimeter (cm) Pyrex absorption cell at 578 nanometers (nm), using a Beckman model Du spectrophotometer, or equivalent in the following manner:

4.5.3.3.1 Procedure. Measure 1.000 \pm 0.005 grams of molding compound into a 100 milliliter (ml) volumetric flask. Add 50 ml of 85 percent phenol put stopper in the flask securely and shake for 4 hours on any standard shaking machine or until all of the nylon is in solution. Solution time can be shortened by heating for 1 hour under infrared lamps at 50°C. Remove flask from shaker, shake vigorously by hand, and immediately pipette 1 ml of the solution into a 50 ml volumetric flask, allowing proper time for drainage. Dilute to volume with 85 percent phenol and shake vigorously by hand. Balance the spectrophotometer at zero absorbance at 578 nm by filling two 1 cm absorption cells with 85 percent phenol and placing them in the cell compartment of the instrument. Refill one of the absorption cells with the final diluted sample and measure the absorbance at 578 nm, using the other cell containing 85 percent phenol as reference.

TABLE VI. Methods of test and form of specimens.

Test	FED-STD-406 method No. or ASTM No.	Modified by paragraph	Number of samples or specimens	Form of specimens
Melting point - - - - -	D789	---	2	(1/)
Specific gravity- - - - -	5011	---	3	(2/)
Deformation under load- - -	T101	---	5	(See method 1101, FED-STD-406)
Stiffness - - - - -	D747	---	3	(See ASTM D747)
Tensile strength and elongation- - - - -	D638	4.5.3.1	5	Type I per ASTM D638 6/
Impact strength - - - - -	1071	---	5	(See method 1071, FED-STD-406)
Heat-distortion temperature -	2011.1	---	3/ 10	1/2 inch x 1/4 inch x 5 inches
Water absorption- - - - -	7031	4.5.3.2	3	Disk, 2 inches dia x 1/8 inch thick
Absorbance- - - - -	---	4.5.3.3	3	(1/)
Carbon content- - - - -	---	4.5.3.4 to 4.5.3.4.4 incl.	3	(1/)
Moisture content- - - - -	D789	---	3	(1/)
Granulation - - - - -	---	4.5.3.5	3	(1/)
Contamination - - - - -	---	4.5.3.6	3	(1/)
Insulation resistance - - -	4041	4.5.3.7	3	(See 4.5.3.7)
Dielectric strength, step-by- step test (flatwise)- - -	4031	4.5.3.8	5	Disk, 4 inches dia x 1/8 inch thick
Dielectric constant and dissipation factor 4/ - - -	4021	---	5	Disk, 2 inches or 4 inches dia x 1/8 inch thick
Relative viscosity 5/ - - -	D789	---	2	---

1/ Determinations shall be made on samples of the molding compound in granular form.

2/ Specimens to be cut from molded blanks.

3/ Five specimens tested at 66 psi and five at 264 psi.

4/ The dissipation factor is the cotangent of the dielectric-phase angle or the tangent of the dielectric loss angle.

5/ For types VI, VIIA, and VIB, the test must be performed using the following: Concentration - the solution is made by dissolving 0.5 grams of polymer in 99.5 grams of solvent. The solvent shall be redistilled Metacresol. Constant temperature water bath shall be 20° ±0.05°C. The viscometer shall be Cannon-Fenske size 300.

6/ If type I specimen is impractical for test, type IV specimen shall be used.

4.5.3.4 Carbon content. This method of test is based on the hydrolysis of nylon to soluble products with hydrochloric acid and the subsequent separation of the carbon residue by filtration. Formic acid is employed to dissolve traces of unhydrolyzed nylon or similar insolubles, if present.

4.5.3.4.1 Apparatus. The apparatus shall be as follows:

- a. Drying oven at $100 \pm 5^\circ\text{C}$.
- b. Crucibles, Gooch, or equivalent, 30 ml.
- c. Staticmaster Utility Unit, Emil Greiner Company, or equivalent.

4.5.3.4.2 Reagents (reagent grade). The reagents shall be as follows:

- a. Hydrochloric acid, 1:1 (about 6 N).
- b. Hydrochloric acid, 1:3 (about 3 N).
- c. Methanol.
- d. Asbestos, long fiber, acid washed, A.H. Thomas Company "Povminco" Grade A, or equivalent. Digest the asbestos for at least 2 hours, using hot 6 N hydrochloric acid. Wash with water on a filter using suction.
- e. Formic acid, 90 percent.

4.5.3.4.3 Procedure. The procedure shall be as follows:

- a. Weigh 1 ± 0.1 gram to the nearest 0.1 milligram (mg) of sample that has been cut into about 1/8-inch cubes and transfer to a 400 ml Pyrex breaker.
- b. Add 200 ml of about 6 N hydrochloric acid and cover the beaker with a watch glass.
- c. Heat the contents of the beaker just to boiling on a hotplate and then continue the digestion for 1 hour ± 5 minutes, stirring occasionally. If necessary, replace any loss in volume during the digestion with 6 N hydrochloric acid.
- d. While the sample is digesting, prepare crucibles as follows:
 1. Cover the bottom with a bed of purified asbestos. Wash several times successively with hot 3 N hydrochloric acid; 90 percent formic acid at 80° to 90°C , inclusive; hot water; and methanol.
 2. Dry the crucible to constant weight in a $100^\circ \pm 5^\circ\text{C}$ oven. Before each weighing, cool the crucible in a desiccator for 15 to 20 minutes.
 3. Place the crucible on the pan of an analytical balance and remove any static charge by passing the "Staticmaster" over it.
 4. Tare the crucible to the nearest 0.1 mg.
- e. Dilute the solution with hot water so that the beaker is almost full, and heat just to boiling. Digest hot for 15 minutes, stirring occasionally.
- f. Remove the beaker from the hotplate and allow the carbon to settle for 15 to 20 minutes. (A dark layer of carbon will be evident at the bottom of the beaker, although some will be suspended in the liquid. The settling step allows the bulk of the separation to be accomplished by decantation and greatly reduces filtration time.)
- g. Filter the warm solution through the weighed crucible, decanting at first and then transferring the bulk of the residue. Remove any adhering residue from the sides of the beaker with a glass rod tipped with a rubber policeman and wash the residue from the beaker with hot 3 N hydrochloric acid.
- h. Wash the residue on the crucible with 100 ml of 90 percent formic acid at 80° to 90°C , inclusive, passing the acid slowly through the bed, using suction.
- i. Wash with hot distilled water and methanol; dry and weigh the crucible as in step (d).

4.5.3.4.4 Calculation.

$$\frac{\text{Percent carbon black} = \frac{\text{wt of residue (including crucible)} - \text{wt of crucible}}{\text{wt of sample}} \times 100$$

4.5.3.5 Granulation. Measure out 8 ounces of the molding compound. Spread the granules of compound, a few teaspoonful quantities at a time, on a piece of clean paper. Remove all lumps measuring over 1/2 inch.

4.5.3.6 Contamination. The procedure shall be as follows:

- a. Measure out 8 ounces of the molding compound.
- b. Spread the granules, a teaspoonful at a time, on a piece of clean white paper (8 1/2 inches by 11 inches). Spread in a layer only one granule thick so that none of the granules are hidden from view.
- c. View the granules from normal reading distance (approximately 14 inches). Using tweezers, remove all pieces containing contamination and place to one side.
- d. Turn the paper completely around and view the granules from all sides. Remove any contamination or nonblack granules overlooked in step c.

4.5.3.7 Insulation resistance. Electrodes shall be American Standard No. 3 tapered pins 3 inches long, having a diameter at the large end of 7/32 inch, and tapering 1/4 inch per foot. The specimen shall be of sufficient size so that two 3/16-inch-diameter holes, centrally located, 1 inch apart, center to center, and perpendicular to the faces of the specimen, may be drilled. The holes shall be drilled as above and then reamed, using a standard tapered pin reamer, to a sufficient depth to allow the pins to extend approximately 1 1/4 inches beyond the small end of the hole. The electrodes shall be inserted after the specimens have been conditioned.

4.5.3.8 Dielectric strength (flatwise). The test shall be made as specified in 4.5.3.8.1 and 4.5.3.8.2, under oil conforming to VV-I-530, at a frequency not to exceed 100 cycles per second.

4.5.3.8.1 Short-time test. The voltage shall be increased uniformly at the rate of 500 volts per second.

4.5.3.8.2 Step-by-step test. The voltage shall be increased by the increments specified in table VII. It shall be held at each step for 1 minute and then changed to the next higher step within 10 seconds. This process shall be continued up to failure.

TABLE VII. Voltage increment for step-by-step test.

Breakdown by short-time test ^{1/}	Increment
Kilovolts	Kilovolts
12.5 or less - - - - -	0.5
Over 12.5 to 25, incl - - -	1.0
Over 25 to 50, incl - - -	2.5
Over 50 to 100, incl - - -	5.0
Over 100 - - - - -	10.0

- ^{1/} Since the short-time value is not required, one additional specimen shall be prepared and subjected to the short-time test to provide initial voltage and increments of increase for the step-by-step test.

4.6 Test reports. Test reports shall be made as specified in FED-STD-406 as applicable; in addition, a summary sheet of test results shall be furnished.

4.6.1 Accuracy of calculations. Observed or calculated values shall be rounded off to the nearest digit in the last right-hand place of figures used in expressing the specified value, except as follows:

- a. For tensile strength - to the nearest 100.
- b. For stiffness - to the nearest 1,000.

5. PACKAGING

5.1 Packaging requirements. Unless otherwise specified (see 6.2), the packaging requirements for molding plastic shall be in accordance with FED-STD-356 (see 4.4.2) except the unit package weight shall not be limited to 25 pounds so long as the weight does not exceed the applicable container requirements.

6. NOTES

6.1 Intended use. Composition A nylons are the polyhexamethyleneamides and are represented by types I, IA, II, and III. (Types I and III were among the first nylons available). Composition B nylons are the polycaprolactams and are represented by types IV, IVA, and V. Composition C polyundecanoamide are represented by types VI and VIA. All compositions are polyamides and the types covered herein are those that are used to fabricate rigid rather than flexible end items. Nylon is used because of its unique combination of toughness, lightness, self-lubricating quality, and resistance to wear and chemicals. Typical uses are for gears, bushings, guides, bumpers, stuffing tubes, coil forms, and jacketing.

6.1.1 Types I, IA, IV, IVA. These types are intended for general-purpose applications. They are the most heat resistant of the nylon plastics, and possess good machinability.

6.1.2 Types II, V, & VIB. These types are weather-resistant, black nylon plastics comparable to types I, IV, IVA & IV in their general characteristics.

6.1.3 Types III, VI, and VIA. These types have lower moisture absorption than other nylon plastics and are useful as general purpose molding resins. When used for electronic and electrical applications, grade E should be specified.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Composition and type required (see 1.2).
- c. Grade E for type III, if required (see 1.2.1).
- d. Whether the material is to be compression or injection molded, or extruded (see 3.1).
- e. Color, with tolerance, required (see 3.1.1).
- f. Packaging inspection requirements (see 4.4.2).

6.3 Government verification inspection. Verification inspection by the Government will be limited to the amount deemed necessary to determine compliance with the contract, and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product (see 4.1.2).

6.4 Weather resistance. The weather-resistance characteristic of types II, V, and VIB nylon plastic results from the inclusion of a specific quantity of finely divided carbon black dispersed with great uniformity throughout the product. The absorbance and carbon-content tests (see 4.5.3.3 and 4.5.3.4) evaluate the quality of weather resistance.

6.5 Chemical resistance. Nylon plastic is not resistant to formic acid, phenol, or concentrated mineral acids. Precautions should, therefore, be exercised to avoid contact with these chemicals.

6.6 Unusual safety considerations. Phenol is a poisonous chemical and readily absorbed by the skin. Care should be used when handling phenol to prevent contact with the skin; ethanol should be kept handy for washing if phenol is spilled. Hydrochloric acid and formic acid are very corrosive to the skin, and rubber gloves should be worn when handling these reagents. Following accidental spillage, wash skin immediately with large quantities of water and report for medical attention..

6.7 International standardization agreement. Certain provisions of this specification are the subject of international standardization agreement ABC-NAVY-STD-17D. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.8 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - EL
Navy - SH
Air Force - 11

Review activities:

Army - EL, MI
Navy - SH
DSA - ES

User activity:

Navy - AS

Preparing activity:

Army - EL

Agent:

DSA - ES

(Project 9330-0747)